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# **Tax Incentives for R&D in Canada: A Review of the Recent Experience**

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## **Introduction**

The tax treatment of expenditures on research and development (R&D) has been modified several times in recent years as the government has sought to establish a viable system of incentives for investment in R&D. These incentives have been designed to raise the level of R&D in order to improve the international competitiveness and productivity of the Canadian economy.

The Canadian environment for R&D has undergone some significant changes in the last five years. Both the 1983 and 1985 budgets introduced several changes to the tax system to provide incentives for increased R&D. Basic elements of these changes involved generous write-offs, generous investment tax credit, introduction of the Scientific Research Tax Credit (SRTC), refundable tax credit etc. As will be shown later in this paper, not all these initiatives were successful; some were shunned by the investors due to complexity and costs, whereas the SRTC program resulted in a substantial cost to the federal government.

The purpose of this paper is to discuss recent Canadian experience with tax incentives for R&D. The intent is to outline some issues in efficiency and cost effectiveness of these various government incentives in promoting domestic R&D. The paper is organized as follows:

In the second section, data is presented on the overall degree of financial support provided for R&D by tax incentives. The experience with limited partnerships as a vehicle for financing R&D is reviewed in the third section. The problems and issues associated with the Scientific Research Tax Credit that led to its termination are considered in section four. In section five the current tax treatment of R&D after the May 1985 budget is contrasted with that in effect before the April 1983 budget and some conclusions are drawn on the relative levels of support for various categories of corporations and regions. The difficult question of the adequacy of tax incentives for R&D is addressed in section six. This includes an examination of the evolution of two indicators of the degree of support for R&D provided by the tax system. These indices are the after-tax cost of R&D and the "B-index" proposed by Donald McFetridge and Jacek Warda.<sup>1</sup> The historical record for industrial R&D spending is also examined to see if there is any obvious relationship between R&D spending and changes in tax expenditures. Section seven presents overall conclusions on the current structure of tax incentives for R&D.

### The Data on Tax Incentives for R&D

Data on the investment tax credit for the 1978 to 1982 period for which they are available are provided in Table 1. These statistics cover only the companies included in the survey of industrial research and development. These companies accounted for 95 per cent of the credits claimed in 1982. In 1982 the investment tax credit for R&D was \$127 million, accounting for 9 per cent of intramural R&D spending of claimants. The increase in the number of claimants and in credit claims in 1979 following the enrichment of the tax credit in 1978 is notable. A similar increase can be expected following the 1983 increases in the credit.

Table 1  
Number of Claimants, Investment Tax Credit Claimed  
and Intramural Expenditures Incurred for R&D

	1977	1978	1979	1980	1981	1982
Number of Claimants	75	143	290	290*	727	841
Credit Claimed (\$ millions)	11	28	58	78	122	127
Intramural Expenditures	340	586	772	999	1,451	1,482
Claims/Expenditures (%)	3	5	8	8	8	9

(\*) The total number of claimants did not decrease in 1980: fewer smaller claimants were directly surveyed for 1980 than for 1979.

Source: Statistics Canada, *Industrial Research and Development Statistics 1983*, catalogue 88-202, p. 45.

An additional allowance for scientific research came into force on January 1, 1978. Until it was replaced by an increase in the investment tax credit in 1983, it allowed companies to deduct from their taxable income an additional amount equal to 50 per cent of the difference between R&D expenditures in the current year and the average of the three preceeding years.

Table 2 shows the number of claimants for the additional R&D allowance and the amount claimed. The 705 claimants in 1982 represented only 41 per cent of R&D performers surveyed, but accounted for 78 per cent of intramural R&D expenditures.

Table 2  
Number of Claimants and Their Claims for the  
Additional Allowance for Scientific Research

	1978	1979	1980	1981	1982
Number of Claimants	103	266	316	620	705
Allowance Claimed (\$ millions)	50	128	182	279	271

Source: Statistics Canada, *Industrial Research and Development Statistics 1983*, catalogue 88-202, p. 51.

Note that the amount claimed is not the same as the tax savings to the firm from the allowance. To derive an estimate of the tax savings the amount claimed must be multiplied by the effective marginal tax rate of the firms claiming the allowance.

Estimates of the total value of all tax incentives for R&D were provided in the Department of Finance paper, *Research and Development Tax Policies*, which was released with the April 1983 budget. These are reproduced in Table 3. This same paper estimated that the changes to R&D tax policies which have now been implemented would add some \$100 million to the approximately \$225 million of R&D tax support currently available and that other budget changes would add another \$85 million. This was estimated to bring the total annual tax incentives for R&D up to \$410 million. Due to much greater than anticipated take-up of the Scientific Research Tax Credit, the current unofficial estimates for the total tax expenditures for R&D are much higher than those published in the budget paper. The cost of the SRTC alone is estimated to be \$1.9 billion or \$650 million per year of R&D funded. Hence, from 1983 to 1985 the annual cost of tax incentives for R&D can be estimated to average about \$1 billion.

Table 3  
Federal Tax Expenditures for R&D

Year	Immediate Write-Off	Investment Tax Credit	Special 50% Allowance	Total
1975	15	—	—	15
1976	15	—	—	15
1977	25	5	—	30
1978	35	20	15	70
1979	40	50	45	135
1980	55	60	45	160
1981	70	75	50	195
1982	60	80	50	190

Source: Department of Finance, *Research and Development Tax Policies*, April 1983, p. 7.

### Limited Partnerships

The Canadian experience with R&D limited partnerships comprises an interesting, but unsuccessful, example of how the tax system can be used to promote R&D.<sup>2</sup> Very little money has ever actually been raised for R&D through this vehicle. Nevertheless, much attention was focussed on the limited partnership offerings which were made to fund the development of computer software.



There were two basic variations of the limited partnership approach. The general partner could conduct the R&D itself or act as a principal and contract with an agent (the research corporation) to carry out the R&D. In either case, the general partner provided management, marketing, and financial services to the limited partners and contract management where the R&D activity was farmed out.

Usually, the general partner was a wholly owned subsidiary of the performer and contracted the R&D activity to the performer.

Results of the research were shared by the partners and research corporation on a percentage of revenue basis in order to avoid royalty treatment. Royalties were deemed to be investment income from property. To qualify for the R&D tax treatment, the earnings had to be from business, not property.

The overall attractiveness of the tax provisions were twofold from the point of view of a qualifying investor considering the purchase of a limited partnership. First, the deductions and credits were deductible from other income or income tax payable of limited partnership investors — a provision similar to that relating to the capital consumption allowance and soft costs of the MURB program. Second, the total expenditure was deductible in the year incurred at the option of the taxpayer and partnership.

The 100 per cent deduction from income for current and capital expenditures on R&D was available to all partners — be they corporations or individuals. The deduction was reduced by the investment tax credit (dealt with later) and government grants. The deductions could be claimed in the year incurred or be carried forward indefinitely. Usually, the partnership covenanted to claim the maximum amount in the year incurred. For corporations (not individuals) who were not partners, i.e., the R&D performer and co-venturers, a 50 per cent research allowance applied. The investment tax credit was also available to limited partners.

Table 4 shows the tax relief for a \$1,000 investment in an R&D limited partnership assuming that the investor has a marginal tax rate of 50 per cent.

Unless an investor was deemed to be a trader of R&D partnership interests or had acquired the interest as an adventure in the nature of the trade, he/she was accorded capital gains (losses) treatment upon disposition of an interest.

An offering to the public of the R&D limited partnership was subject to the requirements of provincial securities laws. Besides the required financial and organizational information, the prospectuses emphasized the high risk and absence of an organized market for the partnership interests.

The attractiveness of the tax savings to high marginal rate payers was stressed. This along with a minimum subscription amount of \$5,000 increased the probability that investors would be individuals with high incomes.

Table 4  
After-Tax Cost of Investing in an R&D Limited Partnership

R&D Investment	\$1,000
Less:	
Investment Tax Credit	(100)
Amount Deductible	900
Tax Savings at 50%	450
Add:	
Investment Tax Credit	100
Add:	
Incremental Tax Saving	—
Total Tax Saving	550
After Tax Cost	450

During 1981 and 1982, there were only six limited partnership offerings to the public. Five involved "research, development and marketing of computer software"; the remaining one involved research in biotechnological products and processes.

Selling investors on the profit potential of a portfolio of projects was the key to marketing the high risk investments. The number of projects involved in a typical software tax shelter provided some diversification, but given the overall risk of each, a general feeling was that these types of investments were very risky.

Compared to the approximately \$2 billion in R&D carried out in Canada in 1982, requests for advance income tax rulings as to eligibility of limited partnerships for R&D treatment only totalled \$80 - 100 million.<sup>3</sup> Even if all the ventures had been successful, they would have accounted for only a very small percentage of R&D spending. There are no data available as to the amount of these \$80 - 100 million that were actually issued. Rough estimates (provided by the Department of National Revenue) place the intended split between public and private offerings at 50/50 and computer software ventures at 50 per cent of the total.

Large companies with financial resources to undertake R&D directly had little inclination to broaden their funding base by utilizing public limited partnerships due to their reluctance to give up ownership of the R&D. In addition, there is a strong preference for internal financing of R&D.<sup>4</sup> Also, solo corporate entities were entitled to all the deductions and credits, especially the 50 per cent research allowance which was not available to corporate investors who were partners. This tax consideration, along with access to traditional equity and/or debt markets made large firms unwilling to fund R&D through limited partnerships.



Notwithstanding the ultimate financial attractiveness of limited partnership funding to small established companies, the logistical problems and upfront financial costs of launching the vehicles constituted an almost insurmountable obstacle. Advance tax ruling, including the determination as to whether the activity qualified as R&D, took up to eight months. In the process National Revenue would consult with other government departments, primarily Industry, Trade and Commerce in the case of computer software, on the technical aspects of the limited partnership's business plan. The delay reflected the government's fundamental ambiguity about how widely the generous R&D tax incentives should be made available. On the one hand, government had released a booklet promoting R&D limited partnerships. On the other, there were concerns about the revenue cost of unconstrained tax incentives for R&D. These concerns were sparked by the emergence of Scientific Research Investment Contracts (SRICs) such as that offered by Northern Telecom which in effect passed R&D write-offs on to individual investors without requiring them to share in the risk of the venture.

The application and waiting time for tax rulings were costly. In addition, the cost of prospectus and clearance through the relevant provincial securities commission(s) added significantly to the financial outlay. For example, one computer software tax shelter partnership estimated that to meet the required legal and regulatory requirements it had to spend some \$200,000 before it was able to bring its issue to market.

Accordingly, with large firms not interested in R&D limited partnerships and most small firms not willing to underwrite the initial costs, the field was left to a few venturesome companies which had much to gain (capital) and little to lose (ownership of the R&D).

These entrepreneurially oriented, but largely undercapitalized entities, saw the limited partnership route as the only way to raise money. Unfortunately, most were unable to clear all the hurdles and except for a few, those that did were unable to obtain sufficient funds to launch their project(s).

R&D limited partnerships are not likely to play a significant role in the financing of future R&D. Since the introduction of the Scientific Research Tax Credit in April 1983, there has been only one successful public offering. It is possible that with the termination of the SRTC there may be a renewed interest in R&D limited partnerships but this has not been evident yet.

### **The Scientific Research Tax Credit**

The most novel part of the R&D tax measures introduced in the April 1983 budget was the Scientific Research Tax Credit. This mechanism increased government support for R&D by assisting firms that could not take full advantage of their R&D tax benefits. This included start-up firms and firms

with unusually large commitments of R&D relative to income. The mechanism allowed such firms to sell the R&D write-offs which they could not use. It thus allowed firms to pre-fund their R&D programs.

Under the mechanism investors financing R&D expenditures by research performing firms received a Scientific Research Tax Credit to offset against their tax otherwise payable. For a financing to qualify for such treatment the R&D performer had to agree not to take advantage of the R&D tax benefits itself.

The take-up rate for the Scientific Research Tax Credit was much greater than expected. In the April 1983 budget paper on R&D tax policies it was estimated that the proposed R&D tax measures would add \$100 million to the level of R&D tax support in 1984. Over the period that the SRTC was in effect its cost was originally estimated to be \$225 million. The most recent publicly available estimate of the cost of the SRTC is \$1.9 billion or \$650 million annually for each of the three years for which research has been funded under the program.

There can be no doubt that the Scientific Research Tax Credit was highly successful in increasing the funds available for R&D. At least twelve of the top 20 companies conducting R&D in Canada have made use of SRTCs. These include such major companies as Pratt & Whitney Canada Inc., Mitel, and Leigh Instruments. Nevertheless there were some fundamental problems with the program which lead to its ultimate termination in the May 23, 1985 budget.

The biggest problem with the SRTC was that it turned out primarily to be a mechanism for selling tax credits in advance of performing R&D and not a means of financing R&D. The most common type of transaction accounting for the largest proportion of funds raised was what was called a "quick-flip." Under this type of transaction an R&D performer would issue a promissory note for \$100,000 and redeem it the next day for \$55,000. The corporation would pay a middleman \$5,000 for arranging the deal and would keep \$40,000. The investor would get \$55,000 in cash plus a \$50,000 tax credit for a risk-free net return of \$5,000.

The objection to the "quick-flip" from an economic point of view is that it was a very inefficient and costly way to deliver tax incentives. It used scarce resources of the brokerage industry for no other purpose than to provide tax relief. This constituted a perversion of the main function of the industry which is to serve as an intermediary in raising capital for investment.

There were several other problems caused by "quick-flips" which should be noted. In many instances a "quick-flip" was a recipe for bankruptcy for firms in weak financial positions without sufficient past R&D to cover the "flip." Such firms were left with significantly less than half the proceeds of the "quick flip" and with an obligation to perform R&D covering the whole amount.



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The situation was worsened to the extent that investment dealers and other middlemen were involved in the transactions. Dealer commissions for "quick-flips" were reported to have been in the 2 to 3 per cent range. Allan Lumsden, a chartered accountant with Coopers and Lybrand in Ottawa, was quoted in the *Globe and Mail* as estimating that the financial, legal and accounting costs of arranging an R&D tax credit deal amount to at least 2 per cent and probably close to 5 per cent of the value of the transaction.<sup>5</sup> The "quick-flip" has thus been a source of easy profits for investment dealers and others. New companies sprung up just to sell tax credits. "Double-flips" by means of which the credits were passed through another corporation entailed correspondingly higher commissions. Commissions reduced the amount of funds left over for carrying out the R&D commitment.

The government established a number of safeguards to protect its own revenues in the case of non-fulfillment of R&D obligations. These included the designation of R&D expenditures by performing companies and the payment of Part VIII tax; directors' liability with respect to the payment of Part VIII tax, and the requirement that investors must show they had exercised due diligence in acquiring an SRTC. (Part VIII tax is the refundable tax, payable annually by a corporation and equal to the total SRTC designations it has made to investors. The tax is refundable when research expenditures are made or SRTC credits are earned.)

It quickly became evident that some companies participating in "quick-flips" did not pay the Part VIII tax that they owed in the month following the transaction. Indeed, the Deputy Minister of National Revenue revealed to the Public Accounts Committee that of the Part VIII tax of \$2.4 billion only \$32 million had been actually collected.<sup>6</sup> In certain cases, the government has had to force companies into bankruptcy in its effort to collect taxes. This was inevitable given the way the tax was structured to allow the sale of tax benefits in advance of being earned. This is an aspect of the SRTC that should be avoided in the future.

Another possibility that must be acknowledged is that the "quick-flip" offered unscrupulous promoters an opportunity to make a fast buck at the expense of the federal treasury. It would have been a relatively easy matter to set up a shell company supposedly to do R&D, to engineer a "quick-flip" and to disappear with the money. In at least one instance this was reported to be the case. As long as investors could show that they exercised "due diligence" in acquiring the SRTC, they would have still benefitted from the SRTC. The potential for such a sham would have been avoided if the investors had had to actually invest their money in the company sponsoring the SRTC. Investors typically scrutinize investments more closely if their own money is at stake than if it is only the government's.



Because of his concerns about the efficiency and effectiveness of "quick-flips" as an R&D financing vehicle as well as the skyrocketing cost of the program, Finance Minister, Michael Wilson, announced a moratorium on "quick-flips" on October 10, 1984. This moratorium allowed the new government time for a complete review of the "quick-flip" in consultation with interested groups. During the moratorium only common equity shares were entitled to the SRTC benefit. Such shares had to comply with the criteria governing shares qualifying for the share-purchase tax credit. Following the completion of the review, the Minister announced the termination of the SRTC in his May 23, 1985, budget effective immediately.

### **The Current Tax Treatment of R&D**

The May 1985 budget built upon the April 1983 budget to establish the current framework for the tax treatment of R&D. The budget measures that provided additional specific support for R&D were:

- the refundability of the 35 per cent tax credit for the first \$2 million of R&D done by small firms; and
- the modification of the definition of expenditures qualifying for R&D tax incentives to cover expenditures "all or substantially all" of which are attributable to R&D and to include current expenditures that are directly attributable to R&D.

The budget measures that reduced the level of support were:

- the termination of the flow-out of the scientific research tax credit effective immediately; and
- the elimination of the "stacking" of the investment tax credit and government grants (requiring the credit to be based on cost of eligible investments net of any government assistance or reimbursements which the taxpayer receives).

The implications of these measures (except for the capital gains exemption and the changes in the definition of qualifying R&D) for the incentive to invest in R&D can be better appreciated by comparing the after-tax cost of \$1 of expenditure on R&D for various classes of R&D performers after the May 1985 budget with that before the April 1983 budget. The tax regime prior to the April 1983 budget was chosen as the standard of reference because it represents the tax system which was in effect before the recent major modifications to the tax treatment of R&D. The changes in the May 1985 budget represented a necessary adjustment to what turned out to be an overly generous and unsustainable regime as a result of the much greater than anticipated take-up of the SRTC.



The main difference between the tax regime for R&D before and after the April 1983 budget (excluding the SRTC) was the replacement of a 10 percentage point increase in the investment tax credit for the research allowance (an additional deduction equal to 50 per cent of the excess of expenditures on R&D over the average of the three previous years).

Table 6 presents the comparison of the after-tax cost of \$1 spent on R&D after the May 1985 budget with that before the April 1983 budget. Several observations can be made based on the table.

Table 6  
Comparison of After Tax Cost of \$1 of R&D After May 23, 1985  
Budget With That Before April 19, 1983 Budget

	BEFORE APRIL 19, 1983 (\$)	AFTER MAY 23, 1985 (\$)
Individuals	0.4500	0.4000
Small Business Corporations		
— R&D not qualifying for research allowance	0.5625	0.4875
— with 50 per cent IRAP grant	0.1875	0.2438
— 35 per cent of R&D qualifying for research allowance	0.5189	—
— 100 per cent of R&D qualifying for research allowance	0.4375	—
— Non-taxable corporations	1.0000	0.6500
Other corporations		
— R&D not qualifying for research allowance	0.4500	0.4000
— with 50 per cent IRAP grant	0.2000	0.2000
— 35 per cent of R&D qualifying for research allowance	0.3625	—
— 100 per cent of R&D qualifying for research allowance	0.2000	—
— Non-taxable corporations	1.0000	0.9600

The R&D tax regime in effect after the May 1985 budget provided for a lower after-tax cost of R&D for individuals and corporations not taking advantage of the research allowance. Non-taxable small corporations have an especially lower after-tax cost because of the introduction of refundability of the investment tax credit on up to \$2 million of R&D expenditures. For both small and large corporations, the investment tax credit is a much better way to

stimulate R&D than the research allowance so that even for corporations that were able to use the research allowance the incentive to undertake R&D may be greater after the May 1985 budget than prior to April 1983.

The May 1985 budget also contained a discussion paper entitled *The Corporate Income Tax System: A Direction for Change* that proposed the substitution of a 7 percentage point reduction in the corporate income tax rate for the most rapid write-offs and the investment tax credit. This proposal has important implications for the incentive to invest in R&D since the tax credit for R&D would be retained. This would tend to promote investment in R&D by according it relatively more favourable tax treatment than other types of investment. On the other hand, such a major shift in the structure of taxation could have adverse effects on manufacturing which now benefits from preferential tax treatment and performs the bulk of R&D. This could be particularly troublesome if planned negotiations with the United States result in freer trade since it is manufacturing that will have to undertake the largest investments to restructure and adjust to a more competitive environment.

Concerning the modification to the definition of qualifying R&D introduced in the May 1985 budget, the clarification of the regulations to read "scientific research and experimental development" is useful. If it works as intended by the Department of Finance, then the issue of the classification of expenditures as R&D will become an administrative matter. To facilitate administration the technical resources allocated to Revenue Canada have been increased. Also, the relaxation of the "wholly attributable" rule for the determination of qualifying R&D and the substitution of the provision that an expenditure "all or substantially all" of which is attributable to R&D responds to industry concerns and should be helpful.

### **The Adequacy of R&D Tax Incentives**

Donald McFetridge and Jacek Warda have examined the adequacy and impact of tax incentives for R&D.<sup>7</sup> Their study was completed and published prior to the implementation of the new R&D tax incentives. Its main conclusion was that Canadian tax incentives for R&D were as generous as any in the world with the exception of Singapore. But it also conceded that R&D incentives of all countries including Canada could be inadequate. According to their estimates, the Canada R&D tax incentives are sufficient to offset an externality of something over 40 per cent (as measured by the excess of the social rate of return on R&D over the private sector rate of return). However, if the R&D externality is as high as the 77 per cent estimated in one study,<sup>8</sup> then the R&D incentives of Canada are not sufficient to offset the externality. McFetridge and Warda do not recommend enriching Canadian tax incentives for R&D. Instead, they expressed reservations about whether it is in Canada's

interest to provide for more generous tax treatment of R&D than other countries given that technology can be developed in one location and used without compensation in others.

McFetridge and Warda presented estimates of the after-tax cost of R&D for Canada and other countries, and estimates of a measure called the "B-index" defined as:

"the ratio of the present value of project-related before-tax income to the present value of project-related costs at which an R&D project becomes profitable for the firm that undertakes it. The B-index is thus the critical benefit-cost ratio. Projects with benefit-cost ratios higher than B are profitable for the firm as a whole and are undertaken; projects with benefit-cost ratios less than B are not profitable and are not undertaken."<sup>9</sup>

The advantage of the B-index is that it takes into account the impact of taxes in reducing after-tax returns as well as after-tax cost.

Table 7 shows the after-tax cost of \$1 invested in R&D and the B-index for the 1952 to 1984 period for a non-manufacturing firm benefitting from no special tax credits. It is noteworthy that the increase in the investment tax credit roughly compensates for the termination of the research allowance. At an assumed rate of inflation of 5 per cent and interest rate of 10 per cent, the after-tax cost and B-index are now slightly lower than before; at a rate of inflation of 10 per cent per year and interest rate of 15 per cent, they are a little higher.<sup>10</sup>

One important feature of the tax changes that is not reflected in the table is the extent to which the existing incentives were made more widely available through the SRTC in 1983 and 1984 and through the temporary refundability of the investment tax credit until May 1, 1986. In the Department of Finance April 1983 budget paper on *Research and Development Tax Policies* it is noted that, prior to the recent changes, 70 per cent of R&D was done by firms who face some limit on their ability to use R&D tax incentives.

Table 8 provides estimates comparing the after-tax cost and B-index by type of firm and location of the R&D in 1981 and in 1985. The R&D tax changes eliminate the differential in the B-index between manufacturing and non-manufacturing firms that was mentioned as a source of slight bias against R&D in manufacturing by McFetridge and Warda.<sup>11</sup> The changes reinforce the bias in favour of small business noted by McFetridge and Warda.<sup>12</sup> This bias is further compounded by the refundability of the 35 per cent investment tax credit for the first \$2 million of R&D by small firms introduced in the May 1985 budget.



Table 7  
The After-Tax Cost of R&D and The B-Index for 1952 - 1984

Period	Assumptions			After-Tax Cost Per Dollar of R&D	B-Index
	Corporate Income Tax Per Cent	Inflation Per Cent	Interest Rate Per Cent		
1) 1952-1960 (excl. 1958)	50	5	10	.504	1.008
2) 1958	47	5	10	.534	1.008
3) 1961-1966	50	5	10	.475	.950
4) 1967-1972	50	5	10	.424	.848
5) 1973	49	5	10	.434	.851
6) 1973	49	10	15	.378	.741
7) 1974	48	5	10	.444	.854
8) 1974	48	10	15	.387	.744
9) 1975	47	5	10	.454	.856
10) 1975	47	10	15	.397	.749
11) 1976	46	5	10	.463	.857
12) 1976	46	10	15	.407	.753
13) 1978-1983	46	5	10	.449	.831
14) 1978-1983	46	10	15	.414	.767
15) 1983-1985	46	—	—	.432	.800

Source: Table 3.2 from D.G. McFetridge and J.P. Warda, *Canadian R&D Incentives: Their Adequacy and Impact*, p. 36, for estimates covering 1952-1983. Estimates for 1983-84 are made following same methodology assuming 20 per cent investment tax credit. Under the new R&D tax regime the B-index is no longer dependent on the rate of inflation and the interest rate. Note that temporary changes in the corporate income tax are not taken into consideration.

Another way to gauge the impact of tax incentives on R&D is to examine the evolution of industrial research and development expenditures in order to see if there is any obvious relationship between the generosity of tax incentives and the level of R&D spending. Table 9 displays the data on R&D spending in several ways. These include the levels and rates of growth of R&D spending in both current and constant 1971 dollars as well as R&D spending as a proportion of GNP.

The strong growth in both current and constant dollar R&D spending in 1964 and 1965 following the introduction of an additional write-off equal to 50 per cent of capital spending and 50 per cent of any increase in operating R&D expenses above their 1961 levels is noteworthy. The share of GNP devoted to R&D rose significantly during this period. A slowdown is evident in the growth of R&D spending, particularly in real terms, between 1967 and 1977 when this write-off was replaced with the less generous Industrial Research and Development Incentives Act which allowed a grant or credit of 25 per cent of

Table 8  
The After-Tax Cost of R&D and The B-Index by  
Characteristics of Firm and R&D, 1981 compared to 1985

Firms & R&D Characteristics	After-Tax Cost		B-Index	
	1981	1985	1981	1985
1) Large, non-Atlantic region non-manufacturing, domestic R&D	.414	.432	.767	.800
2) Large, Atlantic region, non-manufacturing, domestic R&D	.360	.378	.667	.700
3) Small, non-manufacturing, any region, domestic R&D	.519	.488	.692	.650
4) Small, manufacturing, any region, domestic R&D	.565	.520	.706	.650
5) Large, manufacturing, non-Atlantic region, domestic R&D	.476	.480	.793	.800
6) Large manufacturing, non-Atlantic region, foreign R&D	.614	.614	1.023	1.023

Source: Table 3.3 from D.G. McFetridge and J.P. Warda, *Canadian R&D Incentives: Their Adequacy and Impact*, p. 83 for estimates for 1981. An inflation rate of 10 per cent and an interest rate of 15 per cent are assumed in the calculations for 1981. The estimates for 1985 are based on the same methodology. The provincial corporate tax rate is assumed to be 10 per cent. Temporary corporate surtaxes are ignored.

capital spending, but limited the grant or credit for current R&D expenses to 25 per cent of the average of expenditures in the previous five years. During this period the GNP share of R&D drifted downwards. In April 1977 an investment tax credit equal to 5 to 10 per cent of eligible investment was introduced. It was increased from 10 to 25 per cent of eligible expenditures after November 17, 1978. In 1978, following the introduction of the investment tax credit, the growth of R&D spending picked up strongly only slowing as the worst post-war recession took hold in 1981-82. This paralleled but lasted longer than a concurrent boom in capital spending. It raised the share of GNP dedicated to industrial R&D to a high of 0.7 per cent. The share declined only marginally after 1982. Given the large decline experienced by business investment over the period, this could be interpreted as evidence that the R&D tax incentives introduced in April 1983 did provide significant support for investment in what would otherwise have been a very difficult period for R&D. It is important to recall that the cost of tax incentives for R&D averaged about \$1 billion annually over the 1983 to 1985 period. This represented over one-third of R&D spending. It is difficult to see how the recent relatively high level of R&D spending can be maintained now that the SRTC has been eliminated.

Table 9  
Industrial Research and Development Spending

Year	Current dollars (mil. \$) (% change)		Const. 1971 dollars (mil. \$) (% change)		(% of GNP)
1963	176		235		0.38
1964	229	30.1	299	27.1	0.46
1965	286	24.9	362	20.9	0.52
1966	313	9.4	379	4.8	0.51
1967	333	6.4	388	2.3	0.50
1968	339	1.8	382	-1.4	0.47
1969	369	8.8	399	4.4	0.46
1970	420	13.8	433	8.7	0.49
1971	430	2.4	430	-0.8	0.46
1972	462	7.4	440	2.3	0.44
1973	503	8.9	439	-0.2	0.41
1974	613	21.9	464	5.7	0.42
1975	700	14.2	478	3.1	0.42
1976	755	7.9	471	-1.6	0.39
1977	857	13.5	497	5.7	0.41
1978	1006	17.4	547	10.0	0.43
1979	1266	25.8	625	14.1	0.48
1980	1570	24.0	695	11.3	0.53
1981	2126	35.4	851	22.5	0.63
1982	2494	17.3	905	6.3	0.70
1983	2518	1.0	868	-4.1	0.65
1984p	2794	11.0	937	7.9	0.66
1985p	3044	8.9	990	5.7	0.67

Note: The data for 1984 and 1985 represents intentions as the survey was done in April 1984.

Source: Statistics Canada, Industrial Research and Development Statistics (1983). Minister of Supply and Services Canada (1985).

## Conclusions

There are two general conclusions that can be drawn from a review of the Canadian experience with tax incentives for R&D. First, there is general agreement that these incentives are relatively generous. This was the view of both the Wright Task Force and the Senate Committee that recently examined the situation.<sup>13</sup> Second, there is also some evidence from an examination of trends in R&D spending in relation to changes in R&D tax incentives that these incentives have had a positive impact on the level of R&D spending.

There are also several observations on the specifics of R&D tax policy that can usefully be made. The current tax regime for R&D has clearly been in a state of flux in recent years. The April 1983, budget laid the foundation for a new tax regime for R&D. However, the Scientific Research Tax Credit which



allowed tax write-offs and credits to be flowed out to investors in the form of a 50 per cent tax credit turned out to be both too expensive and subject to abuse. It was for these reasons that the SRTC was scrapped in May 1985.

The termination of the SRTC left the government with the problem of how to provide support for those R&D performers that are unable to benefit fully from the relatively generous write-offs and the investment tax credit because they faced some limit on their ability to use R&D tax incentives. Overall 70 per cent of R&D is done by such firms. The government's proposed solution was to allow refundability for the first \$2 million of R&D done by small firms qualifying for the 35 per cent investment tax credit. This takes care of the problem for small firms, but leaves the problem for the large firms that undertake most R&D. This problem is likely to become more acute after the expiry in May, 1986, of the temporary measures which allow for the partial refundability of the investment tax credit. If R&D tax incentives are to be delivered more effectively and R&D spending is to be maintained at its recent relatively high level, this issue will have to be addressed. Some form of continuing refundability within the current framework is the most promising policy option.

A very positive feature of the recent changes in R&D tax policy is the replacement of the research allowance by a 10-percentage-point increase in the investment tax credit. For both small and large corporations, the investment tax credit is a much better way to stimulate R&D than the research allowance so that even for corporations that were able to use the research allowance the incentive to undertake R&D may be greater after the May 1985 budget than prior to April 1983.

## ENDNOTES

1. D.G. McFetridge and J.P. Warda, *Canadian R&D Incentives: Their Adequacy and Impact* (Toronto: Canadian Tax Foundation, 1983), p. 17.
2. This section of the paper draws on a longer unpublished paper prepared jointly with Peter Ross. His assistance and contributions are thus gratefully acknowledged.
3. Department of Finance, *Research and Development Tax Policies*, April 1983, pp. 21-22.
4. A theoretical article by M. Kamien and N. Schwartz, "Self-Financing of an R&D Project," *American Economic Review*, 68, no. 3 (June 1978) and an empirical article by L. Switzer, "The Determinants of Industrial R&D: A Funds-Flow Simultaneous Equation Approach," *Review of Economics and Statistics* (February 1984) provide evidence supporting this preference for internal financing of R&D.
5. Linda McQuaig, "Firms Say Financial Middlemen Reap Rewards of Tax Credit Plan," *Globe and Mail*, July 13, 1984, p. 5.
6. House of Commons, Minutes of the Public Accounts Committee, June 6, 1985, p. 14.

7. D.G. McFetridge and J.P. Warda, *Canadian R&D Incentives: Their Adequacy and Impact* (Toronto: Canadian Tax Foundation, 1983), For the summary of their conclusions see pp. 90-92.

8. Edwin Mansfield, John Rapoport, Anthony Romco, Edward Villani, Samuel Wagner and Frank Husic, *The Production and Application of New Industrial Technology* (New York: Norton, 1977).

9. D.G. McFetridge and J.P. Warda, op. cit., p. 17.

10. In calculating the B-index for the old system, McFetridge and Warda assume that real R&D spending is constant and nominal spending increases with inflation. Inflation thus increases the proportion of R&D qualifying for the research allowance. McFetridge and Warda also take into account the value in annual terms of the once-for-all tax savings associated with an increase of \$1 in a firms R&D budget. This is equal to the interest rate times the tax savings multiplied by the tax rate. The B-index depends on both inflation and the interest rate as long as the research allowance is in effect.

11. Ibid, p. 40.

12. Ibid, p. 39.

13. Ministry of State for Science and Technology, *Report of the Task Force on Federal Policies and Programs for Technology Development*, July 1984, pp. 10-11 and Senate Committee on National Finance, *Federal Government Support For Technology Enhancement: An Overview*, August 1984, p. 41.